1035-33-1426 **Andrea S Bruder*** (Andrea_Bruder@baylor.edu), Andrea Bruder, Baylor University, One Bear Place #97328, Waco, TX 76798-7328. *Jacobi polynomials (α=β=-1), their Sobolev orthogonality, and self-adjoint operators.*

It is a well known result by Bochner that, for $-\alpha, -\beta, -\alpha-\beta-1 \notin \mathbb{N}$, the Jacobi polynomials $\left\{P_n^{(\alpha,\beta)}(x)\right\}_{n=0}^{\infty}$ are orthogonal on $\mathbb{R}$ with respect to a bilinear form of the type

$$(f,g)_\mu = \int_{\mathbb{R}} f\overline{g}\,d\mu,$$

for some measure μ. However, for $\alpha = \beta = -1$, from Favard's theorem, the Jacobi polynomials cannot be orthogonal with respect to a bilinear form of this type for any measure. But are they orthogonal with respect to some "natural" inner product? Indeed, they are orthogonal with respect to a Sobolev inner product. We discuss this Sobolev orthogonality and construct a self-adjoint operator in a certain Hilbert-Sobolev space that has the Jacobi polynomials $\left\{P_n^{(-1,-1)}(x)\right\}_{n=0}^{\infty}$ as a complete set of eigenfunctions. To this end, we show that the quest for the right Hilbert-Sobolev space amounts to the study of the left-definite spaces and operators associated with the Jacobi differential expression. (Received September 19, 2007)